

An Overview of Death Valley's Climate

Death Valley is one of the world's most extreme climates and is colloquially and meteorologically known as the hottest and driest place in the United States and North America. It is one of the hottest and driest places on the Earth, however several other locations record less precipitation annually such as the Atacama Desert in South America and Antarctica, while Dallol, Ethiopia is considered the hottest significantly inhabited location in the world. Satellite estimated skin temperatures have shown the Lut Desert in Iran to have reached temperatures as high as 159.3°F (<http://earthobservatory.nasa.gov/IOTD/view.php?id=77627>).

The climate of Death Valley is heavily influenced by the mountain ranges that surround the valley on all sides, especially those to the west as well as its' location below sea level in a narrow and deep yet sparsely vegetated valley. Death Valley sits in the rain shadow of three major mountain ranges to the west. The primary storm track for cold season storm systems is from the west and northwest. These storms usually originate from the Pacific Ocean and then travel inland, having to move across several significant mountain chains before they arrive in Death Valley. The Sierra Nevada, averaging 10,000 to 14,000 feet intercepts most of the moisture from Pacific storm systems with additional moisture intercepted by the 6,000 to 10,000 foot peaks of the White, Inyo and Argus Mountains just to the east of the Sierra Nevada. Whatever moisture is then left then must cross the Panamint Mountain Range, which reaches to just over 11,000 feet. Additional moisture is then blocked by the Panamints before whatever is left arrives in Death Valley. In the summer, moisture typically arrives from the south and again, has to pass over a number of mountain chains in the Mojave Desert that range between 4,000 and 7,000 feet before reaching Death Valley. Death Valley only averages just over two inches of precipitation a year at the official climate station. About 76 percent of the annual precipitation at Death Valley falls in the six month period between November and April. A secondary spike can be seen in association with the North American Monsoon in the period from July through September.

Death Valley is renowned for the extremely high temperatures it records during the summer months. Temperatures in the triple digit are normal from the middle of May to very early October with the most sweltering days featuring highs of 120°F or greater. July is on average the hottest month of the year in Death Valley. The extreme heat appears to be a combination of several factors including the elevation below sea level, the lack of vegetation especially on the lowest part of the valley floor, the narrow width of the valley and its north-south orientation which likely traps air in the valley, radiation of heat from the rocky surfaces of the mountains that surround the valley and low humidity as dry air heats at a much quicker rate than moist air. Death Valley holds the United States, North American and world air temperature record for the highest reading ever recorded at 134°F. It is only one of a handful of locations in the United States that has recorded minimum temperatures in the triple digits.

Despite the fact that Death Valley has recorded the hottest temperature ever in the United States, it is not the hottest location in the country at all times. Death Valley only holds the record for the hottest temperature ever recorded in the United States for July (134°F on the 10th in 1913). A comparison of the hottest temperature by month at Death Valley and for the United States can be seen below:

Month	United States All-Time High Temperature	Death Valley All-Time High Temperature
January	98°F on the 4 th in 1997 at Zapata, TX	87°F on the 8 th in 1962
February	104°F on the 26 th in 1902 at Fort Ringgold, TX	98°F on the 28 th in 1986
March	108°F on the 30 th in 1954 at Rio Grande, TX	103°F on the 31 st in 2011
April	118°F on the 25 th in 1898 at Volcano Springs, CA	113°F on the 24 th in 1946
May	124°F on the 27 th in 1896 at Salton, CA	122°F on the 29 th in 2000
June	129°F on the 23 rd in 1902 at Volcano, CA	128°F on the 29 th in 1994
July	134°F on the 10 th in 1913 at Death Valley, CA	134°F on the 10 th in 1913
August	129°F on the 23 rd in 1915 at Niland, CA	127°F on the 12 th in 1927 127°F on the 2 nd in 1993
September	126°F on the 1 st in 1950 at Mecca, CA	123°F on the 1 st in 1996
October	117°F on the 2 nd in 1980 at Mecca, CA	113°F on the 2 nd in 1980
November	105°F on the 12 th in 1906 at Craftonville, CA	97°F on the 2 nd in 1931 97°F on the 1 st in 1966
December	100°F on the 7 th in 1938 at LaMesa, CA	89°F on the 3 rd in 1949

Despite being the lowest point in North America, Death Valley is located much further north than other locations below sea level near the Salton Sea in California. As the sun angle becomes lower away from the summer solstice, the amount of sunlight and thus potential heating at Death Valley becomes lower than at locations further south, thus Death Valley is not as easily able to heat up. The effect of the sun angle can also be seen in the normal daily high temperatures for Death Valley, which reach their lowest point in December when the days are shortest and the sun angle is lowest. By January as the days become longer and the sun angle increases, normal high temperatures rise six degrees from the beginning to the end of the month. Largely as a result of its latitude, Death Valley rarely is the 'National Hot Spot' during the months of

November, December, January and February. Even when temperatures may reach well into the 90s or even above 100 degrees during strong offshore flow events in southern California during the fall and winter months, temperatures in Death Valley are cooler as areas along the coastal plain heat up considerably from compressional heating which does not take place in Death Valley during offshore flow patterns. During the winter and even sometimes the spring and fall, the 'National Hot Spot' can frequently be found in South Texas or the Florida peninsula which are further south and moderated from the colder air masses further north by their proximity to water. Communities in the Rio Grande Valley of Texas or in South Florida frequently exceed high temperature values recorded in Death Valley in the time between late October and March.

Few winters have passed without the temperature dropping to or below freezing at least once. Severe cold snaps, while infrequent, have occurred in Death Valley during the winter months mainly in December and January. The most brutal cold snaps in Death Valley have seen temperatures drop into the teens and have had high temperatures stay in the 30s. These cold snaps can threaten dates grown in Death Valley.

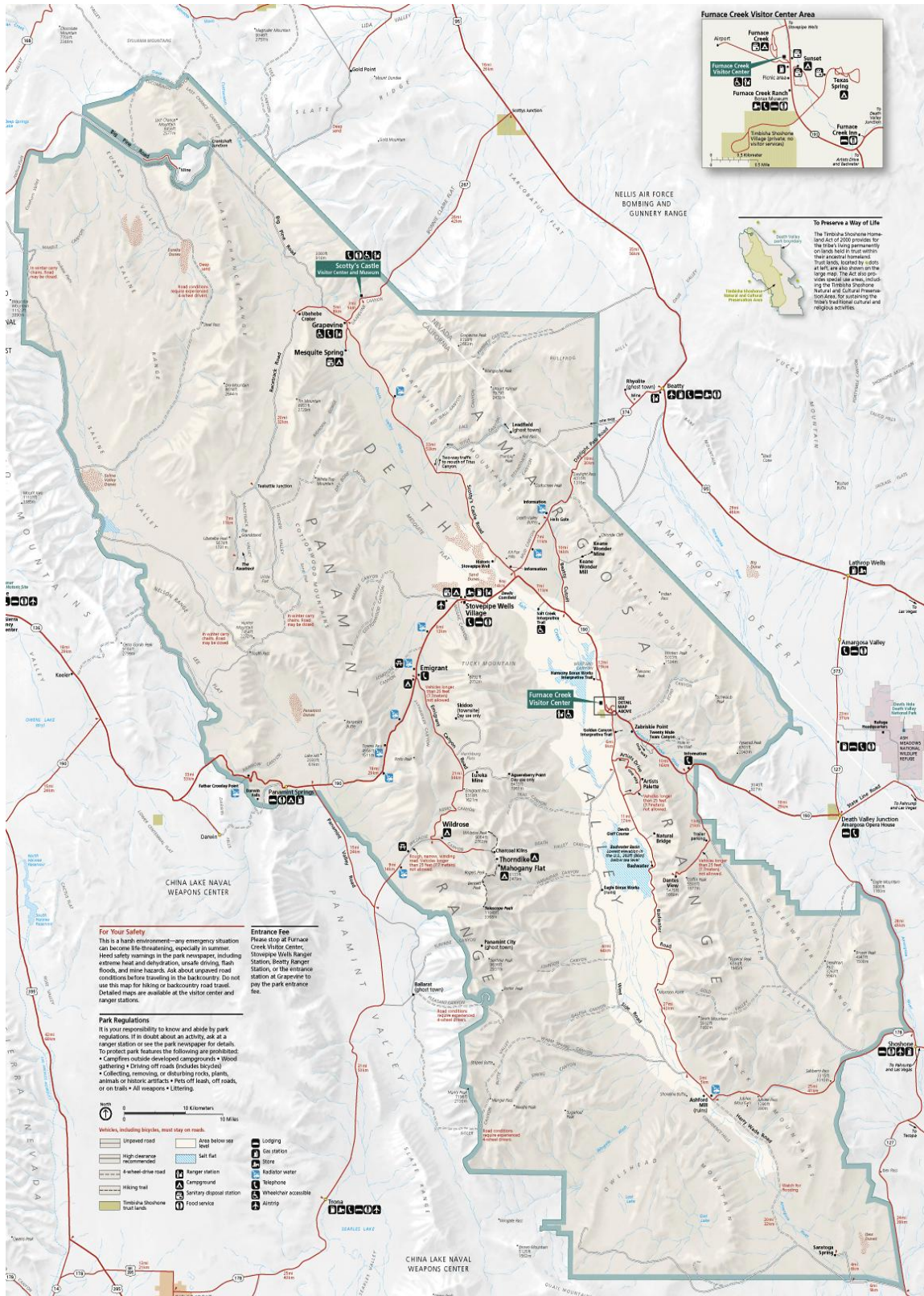
Once winter passes, those winters that do bring above normal precipitation to Death Valley especially over a period of several months are often followed by an extensive wildflower bloom in March and April. These blooms typically peak around the occurrence of the first stretch of multiple days with high temperatures in the 90s. In springs following a winter with below normal precipitation, few wildflowers may bloom – if at all.

Although no official wind records have been kept in Death Valley, reports and observations from park rangers over the years have described the strongest winds often coming from the north and northwest behind the passage of cold fronts. These winds are likely funneled by the narrow valley and enhanced by the orientation of Death Valley. Winds exceeding 50 mph are not frequent, but when they occur can be responsible for lofting sand and dust and creating dust storms that can quickly lower visibility to as low as a few feet. Strong winds associated with cold fronts are most common between October and May. During the summer, thunderstorms will occasionally produce strong winds. Away from storm systems and thunderstorms, winds in the valley at night at the Furnace Creek will frequently come from the east as a mountain-valley wind circulation develops and air rushes in from the mountains into the valley.

Sunshine is prevalent throughout the year in Death Valley. The cloudiest periods occur during the winter. Even then low clouds obscuring the mountains around the valley for more than a day are rare. During the summer, cloud cover can become extensive when monsoon moisture moves into the area. The sunniest periods of the year are typically the transition seasons of the fall and spring. Fog, although unusual, has been reported in Death Valley but does not last more than a few hours.

Aside from the heat, the biggest weather hazard in Death Valley comes from thunderstorms in the warm season and strong cold season storm systems that produce heavy rain. Rainfall totals exceeding even a quarter of an inch on the valley floor can result in flash flooding as runoff from the mountains brings rock and mud downhill and towards the valley floor. In many areas the rugged terrain can quickly funnel water creating dangerous flash flood situations. Flash floods in Death Valley can strand travelers and wash out roads or cover them with debris making travel impossible.

Snow has fallen on the valley floor in Death Valley in the winter but only in a handful of events. Snow can be found on the mountains around Death Valley each winter and as early as October and as late as May in higher mountain ranges such as the Panamints. Colder winter storms about once a winter will produce snow as low as the 3000 foot elevation bringing snow to locations such as Scotty's Castle and Dante's View. Only small hail has been documented in Death Valley. There are no reports of freezing rain.



United States Park Service map of Death Valley National Park.